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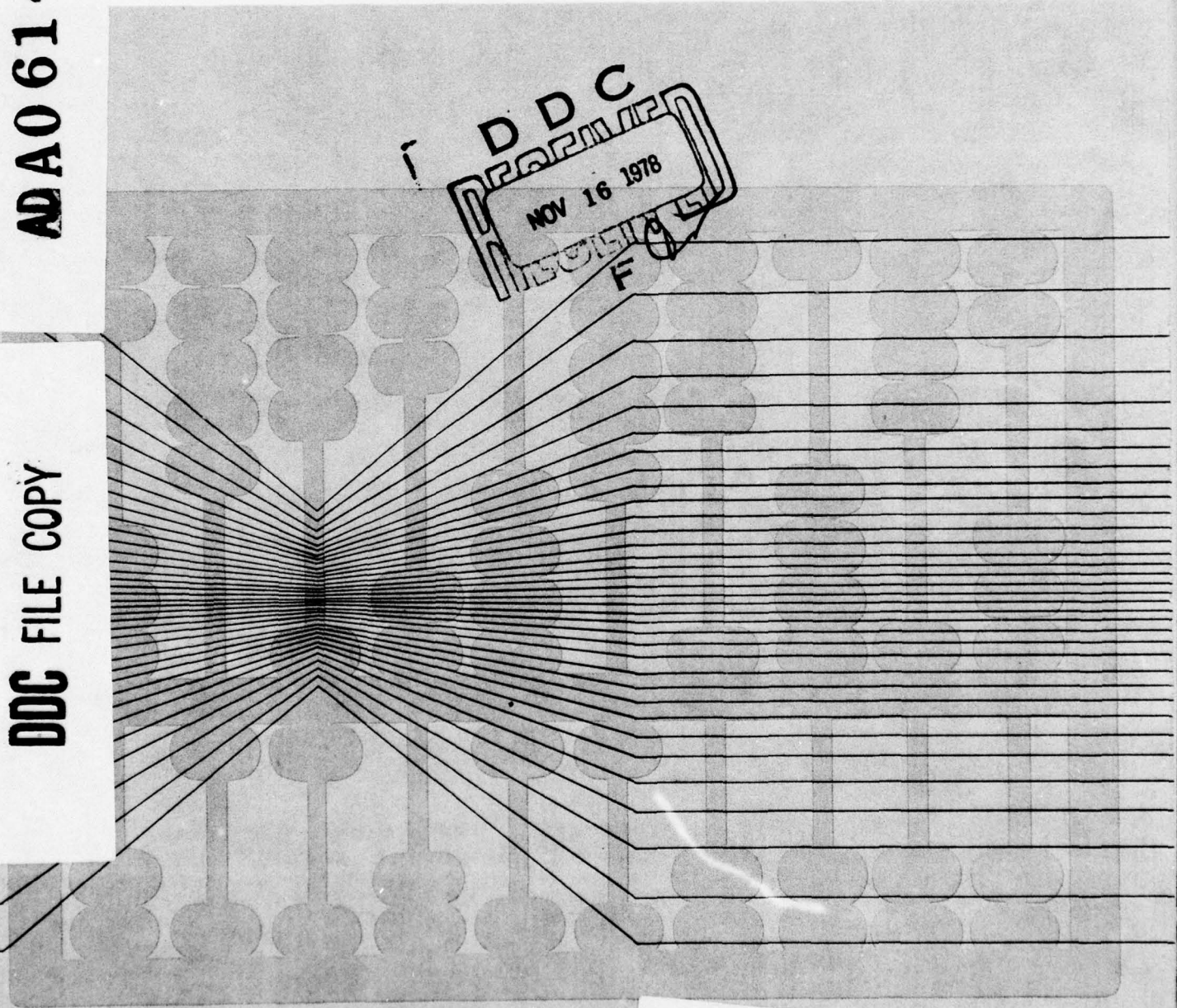
EUCLID COMPILER
QUARTERLY REPORT No 3



Quarterly Technical Report

for

EUCLID Compiler for PDP-11

Number 3

PERIOD COVERED: 1 July to 30 September 1978

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Work on the EUCLID compiler is progressing well althouth the amount of work required is substantially greater than expected. This is because the complexity of the language is finally being fully experienced as the individual passes are being coded.

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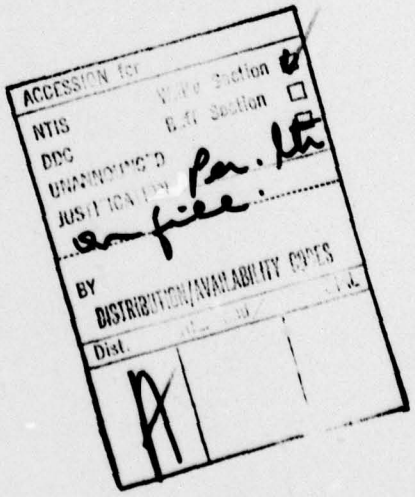
Quarterly Technical Report #3

EUCLID Compiler Project

Report Summary

The period covered is 1 July 1978 through 30 September 1978. During that time work progressed towards the first bootstrapping compiler, known as the translator. The work broke neatly into four tasks, each covered by one member of the team. Each task is a pass of the compiler.

During the period covered it became apparent, as a result of the work performed in each of these tasks, that the overall complexity of the compiler is much greater than previously anticipated. Consequently the time required to complete it will be greater than expected. The project is, currently, two to three months behind schedule. It is anticipated that the principal proposed user of the compiler, Ford Aerospace, will now write its first version of KSOS in a different language.



Quarterly Technical Report #3

EUCLID Compiler Project

The principal result of work carried out in the period being reported is the knowledge gained concerning the complexity of the required compiler. The language, EUCLID, bringing together, as it does, so many previously unlinked concepts, has introduced a number of interactions which result in this complexity.

This aspect of the language was quessed earlier by Prof. Holt, but it was not until the actual coding of the passes that its full effect became apparent. The team has estimated that the complexity of the compiler will be of the same order of magnitude as that for full PL/1.

The work is progressing, but because it is more involved than anticipated, it is proceeding more slowly than hoped and predicted. It is indeed unfortunate that the delays incurred by the slow volume of work will probably mean that the first version of KSOS will use some other language.

The four passes which are necessary for the compiler to be complete and workable beyond the two already done and delivered (the Screener and the Parser) are:

1) The Table Builder - which creates and manages the symbol table and the type table. This pass is the responsibility of James Cordy;
2) The Conformance Pass - which does the major part of type checking, size computation, constant folding and which must provide for the

of legality assertions, David Crowe is in charge of this pass.

3) The Allocator - which assigns space for the various entities to occupy. Prof. David Wortman has essentially completed this pass.

4) The Coder - which emits the formal code. Prof. Richard Holt is working on this pass.

It is a matter of some technical intent that each of these passes has certain characteristics. These are:

(a) each is table driven from a EUCLID constant array. This array is the output of another processing program - the SSL assembler. Basically the requirements of the pass are embodied in the language developed especially for writing compilers by the University of Toronto and known SSL (Semantics Syntax Language). The assembly of this language results in the table.

(b) the routines to be used from walking the table and the walker are all written in small EUCLID.

(c) each pass is designed to receive a task stream and to modify it, if at all, very slightly. After the Builder each pass also references the Symbol Table and the Type Table.

(d) each pass has, as output, either a very similar token stream or, in the case of the Coder, a coded program (in PDP-11 Assembler).

(e) the interfaces between passes are all very well understood and documented. Moreover it is anticipated that one or two more passes will be inserted - to provide for imports/exports checking and to provide for some optimization of the source before it goes into the machine dependent passes (the Allocator and the Coder).

The features of the language being supported by each pass are essentially those defined for Middle EUCLID and modified by the stated requirements from Ford Aerospace. In fact, all passes but the Coder omit only one or two different features form full EUCLID; the Coder will, initially, only handle small EUCLID so that a bootstrap may be performed as soon as possible.

Appendix

The various portions of the compiler (or passes) are listed below indicating, in each case, the percentage of the pass complete as it applies to each of the three proposed phases. These three phases are:

I. A subset of the full language, containing all of Small EUCLID, which will be the first set to be bootstrapped.

II. Middle EUCLID including those features requested by Ford Aerospace (see below).

III. The full language EUCLID, including the handling of legality assertions.

	I	II	III	
Screener/scanner	100	100	100	
Parser	100	100	100	
Builder	95	70	50	percentage complete
Conformance	100	92	10	
Allocator	95	90	70	
Coder	95	40	0	

One more pass, the Access Control Pass, which enforces the import /export lists, is not required at the bootstrap state. No work has yet been done on this pass. It will be placed between the Builder and the Conformer Pass.

The features which are requested by Ford Aerospace are listed below. The status of each of these is also indicated.

1. Non-scalar functions
2. "Simple" parameterized modules
3. Forward type declarations
4. "Simple" bindings
5. Set and module generators in FOR loops (deferred by agreement)
6. Structured array constants
7. Non-standard zones (deferred by agreement)
8. Forward routine declarations
9. Verification of exports/imports (deferred by agreement)
10. Manifest expressions for case labels (simple cases)

Of these, 1, 2, 4 are presently supported (with some minor restrictions) by all phases except the Coder. The plans for the future include first producing a compiler sufficient to bootstrap itself and then to extend it (principally the Coder) to include Middle EUCLID and the Ford requested features.

Features 3, 6 and 8 are supported, at this time, by all passes.

Feature 10 is supported at a level agreed to by Ford - that is, manifest expressions are allowed for Pascal-like CASE statements. (Named) literals are required (only) for discriminating case statements.

Features 5, 7 are causing some difficulty to all passes and have been deferred.

Feature 9 will be handled by the pass to be known as Access Control. It is deferred for the present.

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